

REMARKS

Claims 1-5, 7, 14, 66-68, 76, 77 and 79-84 were examined in the Office Action dated February 19, 2003. All claims were rejected. In this paper, applicants amend claims 1, 5, 66, 79 and 84 and cancel claims 7 and 81-83. New claim 85 is presented, taking its subject matter from claim 5 and finding support on page 13 of the specification. Claims 1-5, 14, 66-68, 76, 77, 79-80 and 84-85 are now pending.

1. Objection to the Drawings

An objection was entered with respect to claims 82-84 as reciting features not shown in the drawings. Claims 82-83 have been cancelled rather than provide new drawings, and claim 84 has been amended to replace the word “comprises” with “produces” to reflect that the optical structure already shown in the drawings is configured to *produce* a moiré pattern. This change renders unnecessary any new drawings since the schematic representation of the optical structure is already set forth in existing figures in support of claim 1, from which claim 84 depends.

2. Section 112 Rejections

Claims 5, 82 and 83 were rejected pursuant to Section 112.

Claim 5 has been amended to delete the language the Examiner objected to.

Claims 82-83 have been canceled rather than provide new drawings, thereby rendering this rejection moot.

3. Obviousness Rejections

a. Claims 1-5, 14, 79 and 82-84 Are Not Obvious over Uyama

Claims 1-5, 14, 79 and 82-84 were rejected as being obvious over Uyama Patent No. 5,700,550. Applicants respectfully traverse this rejection.

Applicants note that the Examiner reaches a conclusion on page 8 of the Office Action that the teaching of combining base layer 2 and hologram layer 4 into a single layer is “proof” that the hologram will not disappear due to index matching. A related argument appears on page 4 of the office action. Applicants respectfully disagree with this conclusion, and submit that Uyama does not teach this. Rather, Uyama has disclosed the use of a base member 2 having certain characteristics such as flexibility, tensile strength and flatness (see column 5, lines 19-32). Uyama disclosed the formation of a separate layer 4 onto the base member. Rather than require two separate layers, Uyama suggested at column 5, lines 59-61, that selection of a material that is adequate to provide the properties of BOTH the base member 2 and layer 4, allows a single layer to be used.

The Examiner has asked for clarification of Applicants’ position concerning the index matching problem in the event Uyama were to have placed the holographic diffraction structure on the top of his layer 4 rather than on the bottom. As a starting point, Applicants ask the Examiner to consider the situation where a hologram is formed on an organic polymer. Without some form of reflection associated with the hologram, it is not possible for the human eye to see the hologram, at least well enough to serve as a security feature. Those of ordinary skill prior to

the present invention would recognize that depositing an index-matched material onto the hologram would render it non-visible, whereas depositing a reflector onto the hologram would make it visible.

Applying this to Uyama, Applicants ask the Examiner to consider two situations: (1) forming the hologram on “top” of layer 4, adjacent base layer 2; and (2) forming the hologram on the “bottom” of layer 4, adjacent Uyama’s multilayer stack.

Organic polymers have a low index of refraction. Hence, layers 2 and 4 would be substantially index-matched. Taking situation “1” involving the forming of the hologram on the “top” of layer 4, we wish to consider two additional options: (a) adding a base layer 2 (as described in column 5, lines 19-23 and lines 31-32); and (b) omitting base layer 2 (by selecting a material for hologram layer 4 that has adequate rigidity and flatness – see column 5, lines 59-61).

In the case of option (a), placing a material on top of the hologram that has a similar index of refraction to that of layer 4 will not impart any reflective properties in association with the hologram, and the hologram will not be visible. In the case of option (b), omission of the base layer will similarly make it non-visible to the human eye because the air interface does not add sufficient reflectivity in Uyama’s transmissive device. No

By way of contrast, if the hologram structure is placed on the “bottom” of layer 4, and then coated with a high index material such as zinc sulfide, there will be enough reflection at the hologram / zinc sulfide interface to render the hologram visible to a human eye, albeit weakly visible. It is because of the need to obtain this reflectivity, and hence make the hologram visible to the human eye, that Uyama writes at column 6, lines 21-24 that it is important that the layer

below the hologram forming layer be a high-refractive index layer. Were a low index layer to be placed over the hologram, that low index layer would not contribute sufficient reflectivity to the hologram to render it visible.

In view of the foregoing, Applicants have concluded that Uyama teaches ONLY the formation of a hologram structure on the “bottom” of layer 4. And, Uyama certainly does not teach or suggest the formation of the hologram structure on the “top” of layer 4 as required by all pending claims.

No
Applicants made the surprising discovery that a composite structure involving an “optical structure” on the “top” of a light transmissive layer could be observed when the “bottom” of the substrate was provided with an optical coating including an absorber layer on the substrate, an optical dielectric layer on the absorber layer, and a reflector layer on the dielectric layer. This three layer optical coating structure provides a resonant cavity that is reflective in nature, in contrast to Uyama’s partially reflective, mostly transmissive high / low index stack. Also unlike Uyama, who provides a high index layer immediately adjacent the hologram grating, Applicants’ resonant cavity design separates the hologram grating from Applicants’ reflector layer by the thickness of the light transmissive layer, the absorber layer and the dielectric layer.

The claimed combination of an optical structure such as a hologram with the three layer multilayer optical coating defines a complex optical system. One of ordinary skill could not know whether the hologram would be visible or if it would be lost in the strong performance of the optical coating. At the same time, one of ordinary skill could not predict whether the diffractive effects of the hologram would lead to multi-angle incidence of light entering the

optical coating that would interfere with the observance of the normal effects of the three layer structure when observed independently. Uyama would further teach one of ordinary skill away from separating a reflector layer from the hologram structure.

Applicants discovered that the claimed combination works. Indeed, the claimed combination was found to produce to unique effects and despite the spatial separation of the reflector layer from the hologram, the hologram is unusually visible.

All of the pending claims now recite the location of the optical structure on the top of the light transmissive substrate, and a color shifting optical coating including an absorber layer, a dielectric layer, and a reflector layer at the bottom of the substrate. There would be no motivation for one of ordinary skill to modify Uyama to place the hologram pattern on the top of his layer 4, since in the Uyama system that would not work. Nor is there any suggestion that placement of a multilayer color shifting optical coating as defined in these claims on the bottom of Uyama's layer 4 would render the hologram visible, or that the claimed three-layer structure would retain color-shifting properties. Hence, Applicants believe the pending claims set forth patentable subject matter over Uyama.

b. Claim 1 Is Not Obvious over Uyama in View of Berning

Claim 7 was rejected as being obvious over Uyama in view of Berning Patent No. 4,930,866. Although claim 7 has been cancelled, the rejection shall be addressed herein with respect to newly amended claim 1, which now contains the claim 7 requirement for an absorber layer and a dielectric layer.

The deficiencies of Uyama with respect to claim 1 have been discussed above.

Berning discloses a combination of a reflector (Al) / dielectric (MgF₂) / absorber (Cr) with a colored superstrate. Although Applicants acknowledge this structure corresponds to the color shifting optical coating defined in claim 1, nothing in Berning teaches that this structure could be combined with a holographic structure. Even more specifically, nothing in Berning provides any motivation to apply this color shifting optical coating structure onto the other side of a substrate from a holographic structure. Stated another way, there be no reasonable expectation of success in viewing a holograph and observing color shifting by placing the absorber layer of this optical coating design in combination with a hologram. There is nothing in either Uyama or Berning to teach or suggest that the absorber layer of this optical coating structure would provide an equivalent function of the high index layer of Uyama's high / low index stack with respect to visibility of the holograph, so there would be no motivation to substitute the Berning structure for the Uyama high / low index stack structure.

Further, Uyama's structure is a transmissive structure, and use of a reflective structure such as that found in Berning would erase features of Uyama's transmissive structure. Hence, this combination is improper.

And even if one were to combine Uyama and Berning, the Berning structure would be applied directly onto the holographic structure because the Uyama teachings put the holographic structure on the bottom of layer 4, directly adjacent the high / low index stack. By way of contrast, claim 1 puts the holographic structure on the top of the claimed light transmissive layer,

and the optical coating on the bottom of the light transmissive layer. This combination is not obvious from the teachings and suggestions of Uyama and Berning.

c. Claim 80 Is Not Obvious Over Uyama in View of Berning

Claim 80 was rejected as being obvious over the combination of Uyama and Berning. Applicants traverse this rejection of claim 80 for the same reasons discussed above with respect to amended claim 1.

d. Claims 66-68, 76-77 and 81 Are Not Obvious Over Berning in View of Uyama

Claim 66 has been amended to require the optical interference pattern be on the “top” of the light transmissive substrate, and to specify that the color shifting coating includes an absorber, dielectric and reflector, and is found on the “bottom” of the light transmissive substrate. Claim 66 is not obvious over the combination of Berning and Uyama for at least the reasons discussed above. Claims 67-68 and 76-77 depend from claim 66, and hence are not obvious for at least these same reasons.

4. Conclusion

In view of the foregoing, Applicants respectfully request favorable reconsideration and allowance of the present claims. In the event there remains any impediment to allowance of the pending claims which could be clarified in a telephone interview, the Examiner is respectfully requested to contact the undersigned attorney.

Dated this 23 day of May, 2003.

Respectfully submitted,



David O. Seeley
Attorney for Applicants
Registration No. 30,148

WORKMAN, NYDEGGER & SEELEY
1000 Eagle Gate Tower
60 East South Temple
Salt Lake City, Utah 84111
Telephone: (801) 533-9800
Fax: (801) 328-1707

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